V. 13 #10

The

MONTHLY REVIEW

Published Monthly by the

American Electroplaters Society

A SOCIETY FOR THE ADVANCEMENT

OF THE

SCIENCE OF ELECTROPLATING

OCTOBER, 1926

Entered as second-class matter, September 3, 1926, at the Post Office of Chicago, Ill., under act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of February 28, 1925, authorized September 3, 1926.

KRESGE-HOOKER

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COMPANY ATTENTION

Fall in for the annual banquet of Philadelphia Branch, Nov. 20, 1926. Best yet. Everybody's invited; good time, mentally and physically, for all.—Comn.

MONTHLY REVIEW

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American Electroplaters Society

Publication and Editorial Office
3040 Diversey Ave., Chicago

VOL. XIII OCTOBER, 1926 No. 10

EDITORIAL

Hey Fellers: did you know, we have a publishing Committee to Boss the Editor, and the reason is because you haint helping the Editor make good?

Yous Feller's that can write stuff on real plating, and things What goes down the Sewer, h'aint useing the Lead to tell the rest of Us Feller's about it so we can practice same ourselfs.

So just on account of that, the Supreme Society at Newark Annual Convention Decided, it Was Necessary to get some one Who would assist the Editorial Staff of Your Review that if you wont give a little there would Be someone Who Would.

Do you realize that it takes at least 72 papers to keep Our Review Circulating Each Month that You May Be Interested & also know the progress that is being Made Each day? In Our Industry & that only 30 of these are Usualy Contributed at the Convention & each paper is Eligible for a prise and You May Win it & Reflect Credit Upon Yourself—Employer and Branch.

Just try Writeing a Story for the Publishing Committee that they Can prove they helped the Editorial Staff of the Review & time Occupied this way may help Your Brother Plater & Get You Less tickets to Show the Judge on Monday Morn. The Review is One place you can Speed With Pleasure to Yourself & Assistance to Your Fellows, and Gas Used this Way Never poisoned any Plater.

DR. SMITH'S MEDAL AND THE FUTURE OF CHEMISTRY

Honorary Member of Philadelphia Branch

A Science That Has Moved Out of the Scholar's Laboratory into the Marts of the World

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The award by the American Chemical Society at its annual meeting in this city of the Priestly Medal to Edgar Fahs Smith for distinguished achievement in chemical science was a tribute as deserved as it was graceful. It was a graceful acknowledgment of distinguished achievement by a citizen of the town that is entertaining the society, and it was deserved, for Dr. Smith is one of the distinguished chemists of his time.

He occupies the chair of chemistry in the University of Pennsylvana that was offered to Joseph Priestly and refused. He is the biographer of Priestly, the man who discovered oxygen without knowing exactly what he had done and thus enabled Lavoisier, the French chemist, to make great advances. Modern chemistry really dates from Priestly and Lavoisier. Before them the scientists were stumbling around in a maze of uncertain theories.

But in spite of their ignorance, they were able to make a beginning in that assistance to industry through the application of scientific knowledge that in the present days is regarded as indispensable by the wide-awake manufacturers. They improved the manufacture of glass and iron and steel. They discovered the existence of sugar in beets, though the commercial extraction of sugar did not begin until the early part of the nineteenth century. And they did many other things beneficial to industry.

But the chemistry of even the first half of the nineteenth century is very different from that of the first quarter of the twentieth. It has become one of the most fascinating of sciences. Astronomy, with its mystery and magnificent distances, appeals to certain intellects. Chemistry appeals to other intellects not only because of its mystery but because of the infinite littleness of the units with which it deals. Exploration in its realm is accompanied by thrilling adventures, while its fruits are much greater than those of exploration in the polar regions. And the explorer can pursue

his voyages into the unknown while seated in comfort in a chair in his laboratory.

For example, just about a hundred years ago a German chemist set out on a voyage of discovery in the molecule of a well-known acid. He found out what atoms composed it, and then he set to work to build a molecule of the same kind out of the raw materials and succeeded. Thus synthetic chemistry began and an old theory of the relation of life to matter was exploded. Dyes and perfumes and flavoring extracts and various other substances are now made in the laboratory that are identical in composition with the natural substances. And Dr. James F. Norris, president of the Chemical Society, prophesied in his opening address that we should in time be making synthetic food and what may loosely be called synthetic gold and various other minerals. The manufacture of substances out of the raw materials of which they are made has become easy because of the successful exploration of the molecule made up of atoms of different kinds. And the transmutation of one element into another is said by the chemists to be within sight because of their success in breaking down the atoms, which are so named because it was once thought that they were the only indivisible thing in the universe. The word itself means the undividable.

Chemistry today is one of the most practical sciences known. The du Pont works in Wilmington are commonly regarded as a great manufacturing establishment. They are also one of the greatest chemical laboratories in the world, with a staff of professional chemists headed by a man who left a college chair to apply what he knew to practical use. The United Gas Improvement Company has a chemical laboratory equipped for investigation into the secrets of the gas content of coal. There are chemists in every big steel plant in the country, continuously studying the chemical composition of the various irons and steels and making formulas for producing a steel that is stronger than that which comes from the ordinary treatment of iron. They make a sort of synthetic steel that is better than anything that nature produces itself.

They have come to such a pass that in many industries a capable chemist is more important than a hustling salesman. The salesman cannot sell the product unless it will meet the

tests, and it will not meet the tests unless the chemist has done his work properly. But this science is still in its infancy. Vast fields remain to be explored by the youths still in the chemical laboratories of the colleges and universities, and the demand for the services of these men in industry is likely to take many of them from pure research, which in the long run would benefit the world more. Dr. Norris suggested that research in the field of the chemistry of disease, for instance, might produce wonderful results in the relief of suffering and in prolonging life.

THE MANUFACTURING AND FINISHING OF BATH AND SHOWER FIXTURES

By S. T. Lunbeck

In our plant the brass is melted in electric furnaces, about 13,000 lbs. per day, molds being made by air squeezers and poured on special conveyors. All cores are air blowed. After pouring castings are removed to cleaning department, where the sand cores are removed by use of electric hammer, cut off on spruce cutter and placed in tumbling barrels. Here we have deviated somewhat and instead of using regular tumbling barrels we have made use of a concrete type of barrel with excellent results. The grinding or edging department next takes the castings, where they are edged off, some by the old hand method, others on special grinders, using two disc wheels, doing two operations at once and keeping regular measurements.

The parts are then placed in special boxes, where they are moved by lifting trucks to the machine department, where they go through the various operations by machining. Here you will find a large number of hand turret lathes, all air equipped, also several semi-automatic machines for handling castings, a battery of automatic machines and special four-spindle machines turning out thousands of such parts as are made from rod and tube.

The work to be finished is moved by the same method as before to the polishing or grinding department, where it goes through the usual process of roughing and finishing, then to the testing and inspecting department, where all parts are

tested under pressure, all parts not requiring a pressure are given 15 lbs., other parts according to their requirements. They are then moved to the stock room, where they are laid out on assembly group orders, moved to the assembly department, where they are rough assembled and again tested to check any leaks that might have developed from assembly or bad joints.

It is then ready for the final finishing operation and is placed in shop boxes, loaded on a loading platform and sent to the buffing department, where it goes through the usual buffing or rag wheel and tripoli operation, some parts by hand, others by automatic buffer, to get the high finish required, then to the color buffer, or limed, as it is sometimes termed, to receive the final finish and inspection before plating.

The boxes are placed in a receiving rack after coloring where the racker places them on racks, keeping a watch for any rejects that the color buffer might have missed. The racks are specially made, rubber-covered centers to resist the action of acids and plating deposits. These racks are of various number of sprigs, according to the class of work, and can be easily replaced if broken or the accumulation of too heavy a deposit. We have a number of specially designed racks to suit our individual needs, as very little work is wired.

The racks are hung on a sliding bar that carries the work to the cleaning tanks, saving the tank operator walking after them, they are then placed in cleaning solution, using 8 volt straight and reverse current, where they are cleaned almost instantaneously, owing to the finish that they have before plating, about two seconds being required. They are hung in cold water tank, directly behind the tank operator, so that he does not have to walk away, all he does is put the racks in cleaner, use reverse switch, and hang in rinse water. The hanger, in working from an elevated platform which keeps him from having to step up and down and makes his lift easier, takes racks from rinse tank, through cyanide and rinse tank again, which brings him in just a few directional steps to the nickel-plating tank, which is a 20-ft. conveyor tank of 1,000 gallon capacity and which is maintained at a standard P. H. and high metallic content constantly by comparative tests for P. H. and tritration for metallic. As hanger-in puts in a rack he takes out one and hangs it in a cold rinse tank

on a rod; when this rod is full a chain hoist on an overhead rail lifts the rod with numerous racks from the rinse tank to the hot water tank and then to a special rack, where the rod is dropped across and left to be unracked. This saves a lot of strain on raising and lowering each rack from the rinse and hot water tanks and saves many an unnecessary step. The work is then removed from rack, placed in shop boxes on a scale, which deducts the weight of box, a record being kept of the number of pounds produced daily instead of the number of pieces. We are turning out a daily average of 2,800 pounds. From here the work is placed in receiving rack just alongside of the unracking bench, directly behind the nickel-buffer, who passes it over color buff, which requires very little effort, as the work is bright and clear when coming from tank. Some classes are passed directly to the assemblers. The nickel-buffer places the box back in rack, where a checker takes account of the amount and passes it on to the nickel-plated assemblers, where it has its final assembly and inspection before going to the wrappers and packers, thence to the shipping department ready for shipment. I might mention that all operations are directional from foundry to shipping room, always passing in a forward direction.

RECENT ADVANCES IN THE ELECTRODEPOSITION OF TIN

By Charles H. Proctor

It is not the intention of the author of this paper to elaborate upon tin plating solutions in detail, or to discuss the merits of tin plating solutions in general. Anyone who is interested in Electro Tin Plating from the theoretical basis can readily obtain such data by perusal of the splendid paper upon this subject by Edward F. Kern, "Transactions of the American Electrochemical Society," Volume 23, Pages 193 to 213, 1913, also "Electrodeposition of Tin from Tin Salts of Mineral Acids" by Mathers and Cockrum ("Transactions American Electrochemical Society," Volume 26, Pages 133 to 135, 1914), also by the same author ("Tests of Tin Plating Baths," Metal Industry, Volume 14, Pages 200 and 201, 1916). "Peptone as an addition agent in Stannous Ammonium Oxalate Baths," Metal Industry, Volume 14, Pages 252, 253, 1916.

Tin plating has been accomplished commercially for many years. Tinning by contact upon small articles such as pins, etc., made from steel or brass has been common practice in New England for more than fifty years, possibly seventy-five years, I have no exact date. A well-known electrical firm in Chicago has been tin plating small steel articles that were formerly tinned by the molten process for at least twelve years. The reason why Electrodeposits of Tin have not been used more commercially is due mainly to the great difficulty encountered with electro tinning as compared with hot tinning. Until recently tin plating baths have shown an almost unmanageable tendency to deposit spongy, non-adherent worthless coatings. Furthermore, our steel age has demanded zinc rather than tin.

Finally, the acid tin solutions advocated by various investigators have lacked the Throwing Power that is almost absolutely necessary in the Electro Plating Industry because uniformity of deposition of the metal is essential.

In Electrolytic Refining of any metal, throwing power is not an essential factor because the Cathodes are usually flat sheets and the anodes may be closely adjusted to the cathode so the current loss is probably small.

Electro plated articles with deep depressions and unequal surfaces must be fairly well covered with metal. Many articles are fabricated and assembled and united with soft solders. To produce a satisfactory commercial finish upon such articles which are frequently made from several metals, copper, brass, steel, etc., the deposited metal must cover the entire article as evenly as possible.

The electroplater is well aware from his experience in deposition of metals that acid type of solutions do not throw as uniformly as alkaline solutions. Therefore, he has made use of the alkaline solutions to a greater extent than he has acid solutions. Gold, Silver, Cadmium, Zinc, Copper, Bronze and Brass are deposited from Cyanide solutions. Platinum, Palladium and Tin from alkaline solutions of the Phosphates and Hydroxides. Nickel solutions although turned acid still are neutral in their cathodic reaction or only slightly acid.

Nickel cannot be deposited successfully under high acidity as can Copper or Zinc; Tin however can be deposited from solutions of Tin Sulphate, but all these solutions lack the

throwing power necessary for uniform results, as compared with Cyanide or Sodium hydroxide solutions, and so are not used as extensively.

There is no question that Electro deposits of Tin can be more commercially used than at present when we consider that all the food products that we consume today must be enclosed in hermetically sealed tin cans to preserve the food from contamination and decay. It needs but a slight stretch of the imagination to realize what tin means to the human race under our modern methods of living.

No other metal except silver could be used commercially for the preservation of food products and silver has too great an intrinsic value to be used in coating thin sheets of steel to manufacture tin cans for the preservation of food products, as we do now, with thin sheets of steel and molten tin. Some day the discarded old tin cans must be saved to recover the tin, because apparently tin is getting scarcer each year and will continue to do so, unless other sources of supply can be found to keep up with the consumption, we cannot replace tin cans to conserve our food supply with other metals. Glass is a splendid factor but is too fragile to be used to any great extent in the commercial canning industry. We do not realize the remarkable properties of tin and just what a wonderful part it plays in our modern life, but some day we shall do so when perhaps it is too late, unless the frozen barriers of the North on top of the world shall yield a new supply of tin.

Some day we shall do more Electro Tin Plating than we do now, and shall use over again the tin recovered from old tin cans and scrap tin that cannot be recovered in the metallic state so financially successful; as in a salt of tin, that can be Electro-deposited upon ferrous surfaces so easily and successfully as well as other nonferrous surfaces used in connection with food products to produce a tin plated surface even better than when applied by the molten tin process. Nearly a year ago a friend of mine who is Chief Chemist with a well-known firm which is a division of one of the largest manufacturing organizations in the world, desired to know whether it was possible to Electro Tin Plate successfully an article which he described in detail, he said that they had experimented with various types of electro tin solutions but had been unsuccessful in obtaining the uniform deposition of tin they required.

They had been previously hot tinning the article, but the coating had not proven satisfactory. I explained that the article could be electro tin plated successfully and gave him details accordingly.

Before commencing experiments in their research division, he requested to be advised where it was possible to see Electro tin plating solutions in commercial operation. I sent him to a firm in Cleveland who have been tin plating steel foundry chaplets in mechanical barrels for the past few years with almost an identical solution. From the results he saw at this plant, he decided to advocate electro tin plating for this particular product, and experiments were begun.

The results as they stand today from these experiments is the operation of several large tin plating solutions with a volume capacity of two thousand gallons each. More than two thousand refrigeration coils are electro tin plated each day, the sample I present to you is the smallest of its type. The coils in the unfinished state are electro cleansed, copper plated, in a combination cleaning and Copper Plating Solution, and then Electro tin plated for twenty minutes with a maximum current density. I am not positive but I believe the amperes per square foot of surface area, has reached one hundred, but this current density is not permissible upon such articles as coils, etc., but 25 to 40 can readily be carried. The solution advocated for doing this work was as follows:

Water	1 gallon
Sodium Stannate	28 ounces
Hydrated Tin Oxide	2 ounces
Powdered White Starch	⅛ ounce

Potassium resinate prepared by dissolving powdered resin in a concentrated hot solution of Potassium Hydroxide has been found a splendid colloidal factor for this type of solution and can be used as required. The temperature of the solution should be maintained at 160 degrees to 180 degrees F. Anodes of sheet steel and pure straits of Mallacca Tin (70 per cent Tin Anodes and 30 per cent Steel) is approximately the best proportions to use. Voltage 4 to 6. The anode reaction is about 60 per cent as compared with cathode deposition. Sodium Stannate is added at intervals to the solution to maintain a balance.

Hydrated Tin Oxide should at all times be added to the

solution so that some remains upon the bottom of the tin plating tank. The function of the hydrated tin oxide is to replace the tin withdrawn from the solution in excess of anodic reduction. Furthermore, as the metallic tin is withdrawn from the solution by electrolysis, eventually free sodium hydroxide would result in excess. An excess of this material is detrimental rather than beneficial for the deposits of tin. Some free Stannous Chloride may be added to the solution alternately with the Hydrated Tin Oxide. A small amount of Chlorine has been found advantageous in solution, giving a better anodic reduction and better throwing power. An excess of chloride, however, must be avoided because of its corrosive action upon the steel anodes. Sodium Chloride would no doubt give better results because being neutral in its action it would not affect the free sodium hydroxide in the solution. Its addition would be more suitable than adding Stannous Chloride for reasons before stated. Not more than one-eighth ounce per gallon per day would be required to give ample Chlorine, for tin anode reduction. No set rules can be laid down for additions of Sodium Stannate and Hydrated Tin Oxide. This would have to be determined either by current conditions or by analysis of solution at intervals. The value of the steel anodes cannot be satisfactorily explained. Apparently anodic polarization is prevented by the use of such anodes. This has been found to be the most plausible answer for the use of such insoluble anodes in sodium cyanide—sodium or potassium hydroxide solutions of zinc and cadmium.

A splendid field can be opened up in electro tin plating milk cans that were originally hot tin coated and have become worn, etc. This in itself is an immense field all over the United States, several job platers in the West and on the Pacific Coast have already given this matter consideration and I believe from the data I have submitted to them have commenced re-tinning operations.

The Sodium Stannate solution has proven to be the only satisfactory tin solution for the Manicure File Industry, all firms in Fremont, Ohio, manufacturing such products use this type of solution.

There are many possibilities of tin plating copper wire now tinned by the molten method. These could be electro tinned

and passed direct from the solution to the wire drawing dies to produce a lustre coated finish.

There are many articles that could be electro tin plated. Tin is readily polished to a lustre finish by tumbling with macarated leather—bran or hard wood sawdust, Vienna lime or floated Whiting as the polishing medium. Electro tin plated surfaces can be scratch brushed to a lustre finish by dry brushing or by buffing with soft buffs and Vienna lime composition.

The metal industry will eventually find use for electro tin plating upon a more extensive scale as the method becomes better known. If this paper leads to such results, then the author will be amply repaid for the work he has done and the time spent in an effort to accomplish this purpose.

CURRENT MEASURING INSTRUMENTS AND CURRENT REGULATION

In making the best use of current-regulating devices, guided by dependable current-measuring instruments, we secure the most uniformly plated deposits.

The volume of work and general conditions where nickel is plated do not permit the use of ampere hour meters or other methods used in the deposition of more costly metals. Nevertheless, the great rush of work and effort to decrease costs should not prevent an effort to suitably plate the various kinds of work being made.

The lasting success of the product of our factories depends upon the protective as well as the ornamental value of the deposit we apply. In truth the deposit ceases to be ornamental when it no longer prevents corrosion. A light deposit of nickel will buff up beautifully and be 100 per cent ornamental, but the life of that beauty depends upon the thickness of the deposit.

It is the big job devolved upon the plater to determine first the weight of deposit the product of this company justifies, and second, in fairness to the customers, see that all the work receives the right deposit. Summing it all up it means uniform deposits.

It is quite true that there are factors detrimental to an equal distribution of the current at all times, such as the counter electromotive force of inductance or the throwing

power of the solution. It is equally true that the efficiency of our solutions are not 100 per cent and may vary at times These factors are beyond the control of the average plater in every-day practice. Also, they are small factors in securing uniform deposits compared to practices such as judging thickness of deposits by the color or by regulating the current by always using the same point on the rheostat.

The current-measuring and regulating devices generally found in nickel plating rooms are voltmeter, ammeter, and rheostat. In current regulation to govern the rate of deposition, the voltmeter is used to measure the difference of potential across the tank mains, that is, between anode and cathode rods. The plater may determine by trial the best voltage at which to operate the solution, to secure a desirable deposit, as to the character of the metal. Also determine by various tests the length of time to plate the article to secure a suitable amount of deposited metal. This might be reasonably accurate if conditions were not so changeable. Changes are slowly taking place, ever decreasing anode surface with a coating forming thereon acting as an insulation and changes in the temperature and conductivity of the solution. The plater may be aware of these changes in conditions but how does he know what correction to make for them?

The amount of metal deposited on an article depends on the rate of deposition and time. If either one of these factors are decreased the other must be increased proportionately to secure the same deposit. As the rate of deposit depends on the current density, which may be affected by a change in the resistance, a plater guided only by the voltmeter would be handicapped in making the proper correction.

So then, the plater needs to know what current the electromotive force is causing to flow against the resistance of the circuit. An ammeter, if placed in the circuit, will indicate the current flow, which is measured in amperes. The total flow is the amperes per surface area of the entire load. If the total flow is 200 amperes and the entire cathode surface is 20 square feet, then the current density would be 10 amperes per square foot.

Figuring the weight of deposits in ampere minutes per square foot is the most simple and satisfactory way when possible to do so. As an example, two hundred ampere minutes per

square foot gives a fair deposit of nickel on some work. If the current density is 5 amperes per square foot, then thirty minutes will be required to get that deposit. If at any time the plater can use 10 amperes per square foot, then fifteen minutes' plating will get same results. At any time the plater desires a like weight of deposit on any sized load, he can be sure of it, at any current density, if the product of the number of amperes per square foot multiplied by the time in minutes equals 200. Where duplicate work is plated in loads having the same cathode surface ampere minute deposits can be figured on the entire load. As an example, a plater may decide that a certain sized load, perhaps 150 pieces, are suitably plated with 200 amperes flowing for thirty minutes. Same would be 6000 ampere minutes per entire load surface. If the plater would decide to change the voltage, when plating this sized load, he can ascertain the exact number of minutes to run the load by dividing 6000 by the ammeter reading. Perhaps a plater may learn after building up his solution that it is possible to increase the rate of deposition and also secure a satisfactotry deposit. If plating the load requiring 6000 ampere minutes per 150 pieces and the ammeter would read 275 amperes at the increased current density, then 6000 divided by 275 equals 21.8 minutes, which would produce the right deposit.

It is true that measuring the current density per number of pieces or entire load surface is approximate and gives no indication of the actual weight of deposit per unit of surface area. It is also true that if actual area of cathode were known the plater would have no way of knowing actual thickness of deposits on all parts of irregular objects, and then again if calculating deposits in amperes per unit of surface area with 100 per cent throwing power, in the solution, the weight of deposit may vary as much as 10 per cent on different days owing to change in cathode efficiency. Nevertheless the current regulating and measuring instruments spoken of are what we have to work with, also the conditions mentioned which cause irregularities in deposition actually exist and must be reckoned with.

In fairness to our employes and customers our aim is the most uniform deposit possible. So then, fellow platers, on what basis do you figure deposits in your current regulation?

After you have carefully determined the weight of deposit which constitutes a suitable plate, just how do you regulate the rate of deposition and time in making proper allowance for any change in condition? E. W. HEIL.

CHROMIUM PLATING

By Willard M. Scott

Chromium is found principally in chromium iron ore consisting of 68 per cent chromium oxide. Its melting point being 2750 degrees F. indicates that it requires a higher temperature than platinum to melt. On account of its untarnishable and non-corrossive properties stainless steel contains 12 to 14 per cent chromium. The hardness of stellite is attributive to its 25 per cent chromium content. These two factors alone have the importance of chromium. The value of chromium plating is due to the extreme hardness, high lustre and resistance to tarnish and to oxidation of the deposited coat. The printer has found that if printing plates are chromium plated they will print about ten times the amount of prints, and then the plating can be removed and replated. This is also true with gauges which make the life of the gauges indefinite. Automobile accessories can be so plated that the finish will outlive the car. Punches and dies would last indefinitely if coated with chromium and would only be discarded when breakage occurs. The plating of these punches and dies when wear appears makes this possible. In fact chromium has such a wide range in the plating field it would be impossible to name them all. The reflectors of motion picture machines where the heat affects the lustre of these reflectors can be chromium plated in which case it takes the place of platinum. The accumulation of dirt on plated parts is removed by soap and water, restoring its lustre.

There is no danger of the coating pealing, regardless of the use of the plated object. The condition of the deposit when removed from the bath is the way it will remain. A burnt deposit will show flaked chromium when removed from the bath, but an unburned deposit on the same article can never be removed or scaled off. For example, a piece of steel chromium plated can be heated to cherry red, then immediately immersed in cold water without any effect upon the deposit.

[illegible]ware tanks are best suited to [illegible]
[illegible]. Where a small tank is required a cr[illegible]
[illegible]pacity can be set in a metal drum (an emp[illegible]
[illegible]anide container) with a steam coil for heating. To [illegible]
this cold water line can be installed in connection with this coil so either steam or cold water can pass through the same coil, thereby providing temperature regulation of the plating bath. If a large tank is desired, lead heating coils can be installed directly in the plating tank.

The solution contains the following:

Chromic acid	33	oz/gal.
Chromium sulfate	0.4	oz/gal.
Chromium carbonate	1	oz/gal.

Different formulae have been tried, but the results have been the same. The addition of chromium chloride and boric acid has given no different results. Chromium carbonate can be omitted with no marked change.

The temperature of the solution is very important. If the amperage of the work being plated is to be maintained, then the temperature must remain constant, for with this definite amperage reading the temperature is the controlling factor for proper plating. Reference to current density in chromium plating is an approximation. Therefore, in stating 100 to 200 amperes per square foot the wide range of current density required for proper deposition is shown. In defining this important phase of the subject there are the various metals to consider. Of course this applies to all kinds of plating baths, but where low current density is employed it is not appreciated. When steel is being nickel plated with a bath requiring 8 amperes per square foot, it will be found that nickel plating copper under the same conditions will require 4 amperes per square foot. However, this is not apparent to the operator. Now, if steel is plated in a chromium bath at 100 amperes per square foot and nickel at 200 amperes per square foot, then the difference is quite marked both on the ammeter and the generator. This means that cable and hangers of sufficient size must be installed to carry efficiently this high current, otherwise the ammeter will register more current than actually passes through the cathode.

Although the area of the object to be plated may be estimated closely and the current this will draw may be figured

out accordingly, nevertheless after this object is removed from the bath burnt spots on the edges appear, the color may not be satisfactory, or there may be spots unplated. Then the next step is to find the proper distance from the anode to place this work, and using the same current density as before. A firm plating the same objects continuously can standardize all these conditions and expect production to systematize itself the same as other plating operations.

Steel is the easiest to plate. If the articles are somewhat complicated, some of the difficulty can be overcome, since steel work can be racked in the same manner as other types of plating, by turning the work while plating to eliminate marks caused by the hangers, and to permit recesses that ordinarily would not plate to become coated, but this method of plating cannot be applied when plating brass or nickel coated articles. A concentrated chromic acid solution such as this plating bath would render a brass polished surface useless in a few seconds, giving a matte finish and then not plating. In the same manner nickel coated objects have the nickel being dissolved off the work. When the brass is attacked in this way the metal becomes passive, and a higher current is required to cover these unplated spots. If this work is polished a higher current is useless because the surface would now have a matte finish. The remedy for this is to be sure that the work has proper contact before entering the bath. Where work is nickel plated and requires a flash of chromium, a slightly higher current can be employed. It will be found that in a minute and a half a burnt deposit will seldom occur. This being the case, quite a variety of work can pass through the tank without very much thought given to either current density or area. In work of this sort a larger anode surface can be employed. It is generally stressed that anode area should be one-third the size of the cathode area, but in regulating cathode distance from the anode this may be partly overcome.

When it is desired to remove the chromium coating from steel objects, it can easily be accomplished by reversing the current in the plating bath, and by withdrawing the object as soon as the plating is removed, thereby not affecting the high lustre. This cannot be done in case of brass or copper due to the action of the bath upon these metals. In this case

a 2 per cent hydrochloric acid solution with reverse current will give the desired results.

For the plater who cannot make analyses of his solutions the following method will be found quite sufficient to give him chemical control.

When first making up the bath find the Baume reading with the hydrometer. To maintain this reading a solution of chromic acid, 3 ounces to every 1 ounce of chromium sulfate, can be added until correct reading is shown.

Summarizing the important points regarding this work, we find that the following are essential:

1st. The vessel to hold the plating bath must be of material to withstand this strong solution.

2nd. The electric circuits must be of sufficient size to carry this high current.

3rd. Although the solution is easy to control, attention must be given to the maintenance of the proper solution level in the tank with reference to the correct Baume reading.

4th. Uniform temperature must be maintained while plating.

5th. To obtain the highest efficiency in throwing power, the distance between the cathode and anode is the important factor.

6th. It is found that proper plating cannot be obtained without an ammeter because only with the aid of the ammeter can plating be duplicated.

7th. Always have contact before immersing work in the bath. Especially is this essential when brass, nickel and copper are being plated.

CHICAGO BRANCH

Regular monthly meeting of Chicago Branch was held Saturday, Oct. 9th, 1926.

The meeting was called to order with President Jacob Hay presiding and all officers present; there was a very large attendance.

President Hay called on Mr. O. E. Servis, who reported that our chemistry class will hold their first meeting Monday evening, Oct. 18th, 1926, at the Laboratory, 842 W. Erie Street.

Mr. Wilfred S. McKeon of Pittsburg, was visiting with us; he spoke very highly of the way our Question Box program was conducted; also of its highly educational value.

President Hay proceeded to appoint a committee for our coming banquet.

The balance of the evening was given over to our Librarian, who found the following questions in the Question Box:

Question No. 1.—What is the best voltage to use for an electric cleaner; would 12 volts be too much?

Answer No. 1.—Consensus of opinion was that 6 volts was sufficient for general cleaning, if all other conditions were correct, such as temperature, etc. It was also recommended that work to be cleaned should first be soaked in a soap solution or washed in benzine.

Question No. 2.—What is the most up-to-date formula for a hot cyanide copper solution?

Answer No. 2.—One and one-half ounce carbonate of copper, 4 ounces sodium cyanide, one ounce caustic soda, 1 gallon of water was given as the formula.

Question No. 3.—What causes white spots on black nickel work on nickel silver metal sheets?

Answer No. 3.—Zinc was thought to cause this condition; member who asked question stated that the same was overcome by warming up solution.

Question No. 4.—Why does the current increase in voltage in a silver solution during the time of deposit?

Answer No. 4.—Lack of metal and conducting salt was given as the reason.

Question No. 5.—Is there any real way known to prevent spotting out of brass and copper oxidizing on cast-iron casting?

Answer No. 5.—Several ways were suggested such as dipping work in a solution of acetic acid or placing work in a warm oven to bring out spots before scratch brushing.

MILWAUKEE BRANCH

Thursday, Oct. 14, 1926, Milwaukee Branch held a booster meeting at Lipps Hall, 3rd and Prairie Streets, Milwaukee, Wis.

There was a short business session wherein regular monthly business was transacted, and as was stated in the invitation, the rest of the evening was to be a social one, but President Goodsell felt so gratified at sight of so many members of Milwaukee Branch being present and visitors from neighboring branches and the hour being early, decided to have answered a few of the questions in the box.

That each member present have an opportunity to talk and none be missed in this important feature of the branch sessions, President Goodsell asked every one present in rotation to give his views on these questions and if you belong to Milwaukee Branch or have forgotten as a visitor to attend this function, you sure missed a most pleasant evening.

There were 35 members and visitors present, among whom we found Supreme First Vice-President Stuernagel, Dan Wittig, Joe Bierbaum, Ed Werner, the man from Chas. Polachecks and Mr. Yaeger, Mr. Brown, and John Hock, Librarian F. Marks, P. Krause and Messrs. Hazucha and Hunter from Chicago, plus many others. The writer did not get names of, all of whom made a few remarks.

We also had with us Mr. Paul H. Segnitz, consulting chemist, who so recently gave us a mighty fine talk. The editor peeked in also.

At conclusion of the meeting the Daniel of Milwaukee, you all know him, brought in the stuff and the table was laden with plenty of food and we had liquid to wash it down with and Ray Sprang the surprise. It tasted all right and we visited until 11:40, sang a little, listened to music some and real pleasure. Milwaukee Branch extends a most hearty invitation to all A. E. S. members when in our city to visit us. Consult the directory for time and place and come out and meet us.

TORONTO BRANCH

September meeting was held as usual in Forester Hall, 22 College Street, and after a two months' vacation, the boys were glad to meet each other again.

President Barrows made good use of the gavel and soon got down to business. After the usual procedure of reading the minutes, communications, bills, etc., Walter started to give out his report of the Newark convention and if there was anything forgotten or not marked down, well, it just didn't happen. A very keen interest was shown by the members, very earnest discussions followed. The report was well received and a very hearty vote of thanks was extended to our delegate. Resolutions with ambition ran high with the members for Toledo in 1927.

Nickel Plating on Brass

Trustee Ellis submitted a few samples of his work, nickel plating on brass, such as bath room outfits. The first batch in the morning being a full loaded tank, showing deposit to be of a dull, cloudy effect. Some parts of the articles were rather like a smut, although coming up very good with the color buff. Second batch with less articles in tank looked 50 per cent better, and third batch with tank little over half full was completely clear of the cloudy effect and showing a beautiful deposit.

Question: What was the cause of cloudy effect?

Answer: Not enough current available for full loaded tank.

Letter was read from outside member requesting voltage, nickel formula and cleaning solution for the electrodeposition of zinc die castings, which was duly forwarded, also getting him in touch with Earnie Coles, who has had a varied experience in the nickel plating of this metal. Instructor McGill gave a short outline of the intended course to be taken up at the technical school this winter.

Owing to the late hour, a few well thought out subjects for discussion by Librarian Acheson, were left over till the October meeting.

James S. Cairns, Sect.-Treas.

PHILADELPHIA BRANCH

The monthly meeting of Philadelphia Branch was held on the 10th of September, instead of the 3rd, with the President, Geo. Gehmling, presiding.

The School Committee reported everything ready for registration in the elementary and advanced classes on Sept. 13th and 14th, in the Ken-

Registration fee is one ($1.00) dollar. Student attending 75 per cent of the class during the year will have his fee remitted.

Fourteen platers registered for the elementary class of two nights each week and twenty-six enrolled in the advanced class of one night each week.

The committee is well pleased with this showing. All platers and assistants are cordially invited to join these classes which are in charge of a competent instructor.

DETROIT BRANCH

MINUTES OF THE DETROIT BRANCH, A. E. S.

Educational meeting of the Detroit Branch, A. E. S., held October 1, at Detroit Testing Laboratories, with small attendance, but the crowd grew larger as the session went on, subject being "Nickel Titration."

After educational meeting we went down to our regular business meeting with President J. Flanagan presiding.

The application of Alexander Jackson as active member was approved by the board of managers.

A vote of thanks was given Mr. A. T. Wagner for sending out notices of changes taking place in our business and educational meetings.

Under good of the order, discussion on single and double salt solutions. Also a cure for spotting out was wanted. A number of immersions in hot and cold water was suggested. One member asked if salt spray test was fool-proof. Answer it was not but was the nearest thing known as an atmospheric corrosion test.

Meeting adjourned at 10:30 p. m.

NEW YORK BRANCH

The meetings of the New York Branch, A. E. S., held at the World Building, Park Row, New York City, in September were instructive and well attended at the first meeting cleaning and preparing die castings for nickel plating, also tripoli and acme for cutting down same proved to be a very interesting subject to take up and were fully discussed.

At the second meeting held in September which was a good welfare meeting nickel-plating solutions for die castings were discussed at length cadmium plating and its preference over zinc proved something new and interesting among the members attending the meeting and it took up a great deal of time in the discussion.

The branch decided to have an invitation meeting on December 9, 1926, to be addressed by prominent men in our line invitations to be sent to platers who are eligible to membership in our society.

Ralph Lignon, Rec.-Sec.

NEWARK BRANCH

Newark Branch held its first regular meeting of the month, which was the educational meeting, on Friday, October 1st, 1926. President Geo. Onksen presiding. Twenty-two members being present. Within

15 minutes' business was dispensed with and the balance of the meeting was devoted to reading of papers and discussion. Mr. Calabrese, our librarian, opened the discussions by reading a paper on brass plating and calling for discussion on same.

Mr. Sizelove spoke upon the removal of carbonates from copper and brass solutions using barium chloride.

Mr. Reuter spoke upon etching of sterling silver.

Mr. Bohler, in speaking on brass solutions, stated that he has not added any zinc to 3 brass solutions for the past 5 years.

Mr. Clark spoke upon the deposition of nickel, using sodium citrate, upon die castings made of zinc alumium base.

Messrs. Dressel, Young and Schuering spoke upon green and white gold solutions.

This meeting, the first under the new regime of devoting the entire evening to educational features, was a huge success and warrants the change.

Meeting adjourned at 10:30 p. m.

APPLICATIONS

L. F. Zettle, 11th and Noble Streets (Active).....Philadelphia Branch
Louis Manheim, 721 Sanson Street.....Philadelphia Branch
Alexander Jackson (Active) .....Detroit Branch

ELECTIONS

Walter Dingle (Active) .....Indianapolis Branch
John M. Gruebler (Active) .....Philadelphia Branch
Harvey J. Gausing (Active) .....Chicago Branch
H. E. Button (Active) .....Cleveland Branch
Chas. Lee (Active).....Cleveland Branch
Elmer Unrup (Associate).....Dayton Branch

REINSTATEMENTS

Wm. Cartheuser, 1446 N. Mount St.....Indianapolis Branch
William Stopper, 2042 N. Tripp Ave.....Chicago Branch
William Donuth, 605 Beloit Ave.....Chicago Branch

RESIGNATIONS

John W. Lamorder.....Bridgeport Branch

TRANSFERS

John G. Andrews, Reading Branch to.....Philadelphia Branch

SUSPENSIONS

H. E. Armour .....Milwaukee Branch
Roy W. Armour .....Milwaukee Branch
O. C. Hintze .....Milwaukee Branch
H. Heckenbec .....Milwaukee Branch
L. A. Edelman.....Philadelphia Branch
Otto Fiss .....Chicago Branch

DEATHS

George K. Elliott, 3200 Jefferson Ave., Cincinnati, Ohio, Sept. 23, 1926. .....Honorary Member of Cincinnati Branch

BOSTON

Regular meetings are held first Friday of each month, at 8 p. m., at the Boston Platers' Supply Co., 202 Friend St., Boston. Secretary, A. W. Garrett, 24 Juliette St., Dorchester, Mass.

BRIDGEPORT

Meets first and third Friday of each month at 62 Cannon St., Room 17, Bridgeport, Conn. Secretary Wm. Ehrencrona, 872 Hancock Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., Atlantic Hotel, 316 S. Clark St. Secretary, Robt. Meyers, 2432 Wilson Ave., Chicago, Ill.

CINCINNATI

Meets every Thursday, 7:30 p. m., at Vocational Training School, Spring and Liberty St. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets first Saturday of each month at Hotel Winton. M. E. Zadowski, 6517 Bridge Ave.

HARTFORD-CONN. VALLEY

Meets in Springfield on alternate months. The Hartford meetings are held at the Hartford Engineers' Club, 12 Haynes St., and the Springfield meetings are held at the Springfield Chamber of Commerce, Broadway and Worthington St., Springfield. Tennant Elwin, Secretary, 117 Hobart St., Meriden, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Albert Bates, Box 34, Vandalia, Ohio.

DETROIT

Meets the first and third Friday of each month at the Detroit Testing Laboratory, 554 Bagley Ave., Detroit. Secretary, Chas. Mascola, 2041 Beard Ave., Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., N. E. Secretary, John Raven, 1139 Emerald Ave., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at Lipps Hall, 321 3d St. J. N. Hock, 310 Galena St., Milwaukee, Wis.

MONTREAL

Meets last Friday of month at Office of Secretary, John H. Feelay, 411 Aylmer St., Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at Franklin Hall, 41 Franklin St., Newark, N. J., at 8 p. m. Secretary-Treasurer, Royal F. Clark, P. O. Box 201, Newark, N. J.

NEW YORK

Meets every second and fourth Fridays of each month in the World Building, Park Row, New York City, N. Y. Secretary, J. E. Sterling, 2595 45th St., Astoria, L. I.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 184 Washington St., Room 308, Providence, R. I. Secretary, J. H. Andrew, 19 Rosedale St., Providence, R. I.

ROCHESTER

Meets every third Friday of each month at the Powers Hotel. C. A. Reama, Secretary, 512 Lyell Ave., Rochester, N. Y.

ST. LOUIS

Meets first Tuesday of each month at Barr Branch Library, corner Jefferson and Lafayette Sts. Secretary, F. P. Menniges, 4019 Molozan Ave.

TOLEDO

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, W. W. Weiker, 411 3d St., Toledo, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. J. C. Cairns, 10 Wiltshire Ave., Toronto, Ontario, Canada.

WATERBURY

Meets every second and fourth Friday of each month. Secretary, Wm. F. Guilfoile, 14 Oakland Ave., Waterbury, Conn.